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B.E.T.R.O.

Many readers will have read in the daily Press of the formation of the British Export Trade Organisation, and have since been making up their minds as to whether or not they should recommend the firms to take up membership. No definite advice can be given because overseas selling is too complicated. Power stations and pills obviously demand a different technique. However, such an organisation as has been launched does appeal to us as being worth while from an angle which has not been stressed in the pamphlet "A Plan for Market Research Overseas."

In pre-war days, we in common with the rest of the Press, received from the Department of Overseas Trade lists of "Contracts Open." These were culled from every corner of the earth, and the technical and trade Press extracted those which the editor deemed of interest to the industry he served. It can well be imagined what results this broadcasting produced. The first item looked for by the overseas industrialists and the London agent were these notices, and but little time was lost before a tender was submitted. It might be asked why were the lists of contracts so publicised? The Department of Overseas Trade could never be certain that it possessed a complete list of every firm interested in a particular enquiry, so private circulation was ruled out because if any firm was not included, a "question in the House" was more than a possibility.

The creation of the B.E.T.R.O., as the organisation is to be known, very largely removes this disability. In the statement as to the limitations of membership there is apparently no place for employers' associations. This is rather restrictive as quite a number are 100 per cent. British as to membership, and the operation of an overseas market research department is both costly and a duplication of effort. We commend this to the consideration of the council of B.E.T.R.O., as there exists a number of associations which have come into existence as a result of a call from the Board of Trade to form Export Groups, and as such are not merely interested in overseas trade, but are ready to co-operate to undertake market research and deliver the goods in the most economic fashion.

There is a considerable representation of British advertising agencies on the Council. This is all to the good, because this body is well placed to realise that with modern sized concerns co-operative action is sole means for expanding their overseas trade and finding new markets. We look to them to stress our viewpoint to that provision, for "associations" should be included. Finally we feel we should draw attention to the fact that already there seems to be growing up rather too many interests specially organised or reorganised to help with post-war exports. The Federation of British Industries has always appealed to us as being exceptionally well placed to undertake the leadership in this particular activity, especially if it was garnished with the ginger which the advertising agencies can supply.

PURE IRON, made at the rate of 1,000 lbs. per year in radio-wave furnaces by Westinghouse Electric & Manufacturing Company, is said to contain only 1 oz. of impurities each year. The iron, therefore, provides a ready check on the composition of steel, aluminium, magnesium, and other metals. This 99.99 per cent. pure iron is formed into rods about the size of a lead pencil, which are heated with an electric arc in a spectrograph. Wave-length pictures of pure iron are then compared with similar pictures of the particular metal being tested, enabling composition of the latter to be determined quickly and accurately. This super-refined iron is produced, first, by electrolysis, and second, by heating the metal in a radio-wave furnace with a hydrogen atmosphere.

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A NEW TYPE OF CRUCIBLE FURNACE

We illustrate on this page a new type of tilting furnace which has been designed by the Morgan Crucible Company, Limited, of Battersea, London, S.W.11. A full technical description of this plant appeared on page 230 of our issue of March 22 last.

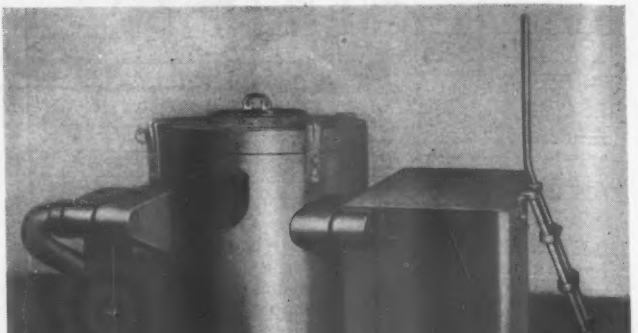

FIG. 1.—THE NEW MORGAN FURNACE.

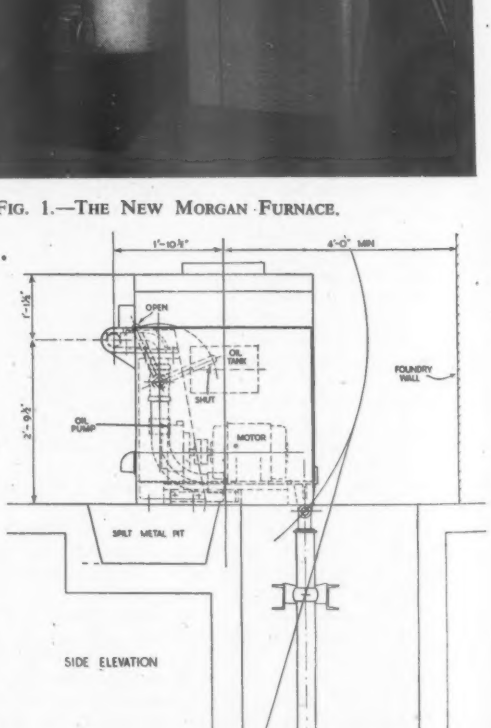

FIG. 2.—SECTION THROUGH THE FURNACE SHOWN IN FIG. 1.

CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

YOUTH AND THE FOUNDRY INDUSTRY

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—May I be permitted to make some further suggestions which have been put forward by some of my members who have overcome the difficulty of directing youth to their works?

Some members have invited such bodies as the A.T.C. and other cadets to inspect their works and have given them tea, whilst others have adopted a similar procedure with the top classes of local schools, *i.e.*, boys about to leave school.

The result has been that, instead of one or two youngsters being sent along, quite a large number have actually applied on their own initiative for employment at the works in question, and I pass the idea to your readers for what it is worth.—Yours, etc.,

EDGAR N. HILEY,
Secretary.

The National Brassfoundry Association,
106, Edmund Street,
Birmingham, 3.
March 23, 1945.

PUBLICATION RECEIVED

"A Study in Vibration." By R. G. Manley, B.Sc. Published by Silentbloc, Limited, Victoria Gardens, Notting Hill Gate, London, W.11.

This 32-page booklet is a reprint of an article which originally appeared in "Aircraft Engineering." Thus, as would be expected, the author devotes most of his argument to aircraft problems, but in the last paragraph he does indicate that industrial troubles due to vibration can be cured by the application of mathematical investigations and specialised engineering methods.

PICKLING IN THE VITREOUS ENAMELLING INDUSTRY*

Development of mass production and the chemistry and physics of pickling

By N. SWINDIN, M.I.Chem.E., A.M.I.Mech.E.

The protection of articles of iron and steel sheets by vitreous enamels is a rapidly growing business. The demand for the labour-saving house, and the preventing of corrosion of iron and steel is gradually transforming all metallurgical industries. The covering of iron and steel with vitreous enamel is one of the oldest, and in time will be the best, of the anti-corrosive coverings. For chemical work, however, it could be much improved.

Before any protective covering is applied to the iron and steel sheets and articles, every trace of dirt, rust oxide and grease must be removed. This is usually done by dissolving away these oxide films with corrosive acids. Hitherto, little attention has been given to this pickling process, simple immersion in cold dilute hydrochloric acid in stone tanks being the usual practice.

In the vitreous enamel industry, it is the practice to purchase already pickled sheets, so that any further pickling operation could be regarded as a simple cleaning job. In fact, it is so simple that there was little inducement for the enameller to study the operation.

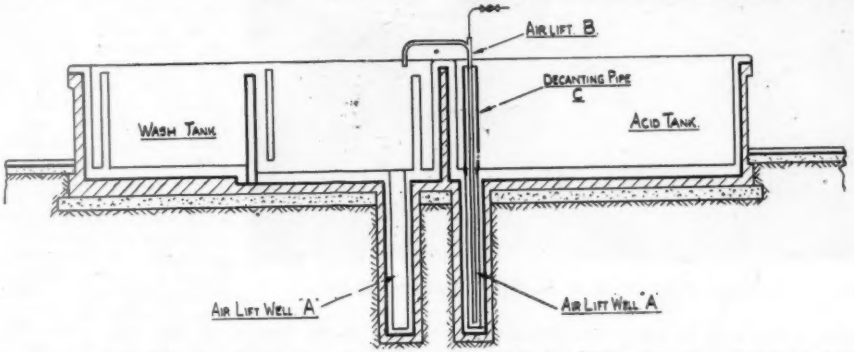

FIG. 1.—SECTIONAL DRAWING OF A PICKLING INSTALLATION AT THE WORKS OF R. & A. MAIN.

The enameller is beginning to notice the developments that are now taking place in the pickling of raw sheets and metal, which developments are mainly due to the growing civic consciousness that spent pickle must not be allowed to pollute drains, sewers, rivers and the land. A survey of this subject has already been given by the Author in a Paper read recently before the Institute of Chemical Engineers,[1] and to which reference should be made to avoid repetition.

It may be advisable, however, to summarise briefly the chief points of this Paper. The Paper dealt chiefly with the treatment and regeneration of spent pickle. The matter, owing to paper shortage, was highly condensed, but it claims to be a fair summary of the practice in the U.S.A., Germany, and this country at the moment. The general physics of the sulphuric acid bath is explained with reference to the triangular equilibrium diagram of the components $FeSO_4-H_2O-H_2SO_4$. Other diagrams are given showing the solubilities of solutions of $FeCl_2$ and H_2SO_4. Mention was made of the double or mixed bath of HCl and H_2SO_4, of which the de Lattre process, largely used on the Continent, is an example. A description of a modified form of this process recently erected by the Author's firm, was given. Reference was made to Winterbottom and Read's Paper[2] on the theory and practice of pickling. Then follows an historical survey of pickle recovery over a period of 40 years, beginning with George E. Davis's mixed bath process of 1904, to the de Lattre of to-day. A considerable portion of the Paper is devoted to condensing the contents of an important account of an investigation of the sulphuric recovery processes, carried out by the Mellon Institute of Industrial Research, Pittsburg, U.S.A. A mere outline of each process could only be given, as the investigations covered processes in Europe as well as the U.S.A., but the collection of so much information in abstract form is a necessary introduction to any

* Paper read at the Tenth Annual General Meeting of the Institute of Vitreous Enamellers.

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study of pickling. Sandwiched in this list are the newer processes now being developed since the article appeared in the American journals.

To illustrate the design of modern plant for regeneration of spent pickle, detailed accounts are given of the following types:—

1. *Plant in which sulphuric acid is cooled, e.g.*, the Steel Peech & Tozer and Kestner-Fakler processes. The first cools the pickle to −5 deg. C. by refrigeration, and the second cools it by water to 20 deg. C.
2. *Plant in which pickle liquor of mixed acids is cooled, e.g.*, the de Lattre and the Tinsley Wire Company processes. The de Lattre plant erected recently in this country embodies rubber-lining practice, a new type of pump, and provision for keeping all piping free from deposit of salts. The Tinsley Wire plant cools the liquors in open vats by air currents set up by rotating blades—a very simple plant.
3. *Plant in which pickle liquors are evaporated by the submerged flame*—the N. Swindin process.

Reference was made in the Paper to the Curran spray pickling machine, in which the articles to be pickled are carried through a chamber in which the pickle is sprayed. The Paper concludes with a comprehensive bibliography consisting of 61 references.

FIG. 2.—GENERAL VIEW OF R. & A. MAIN'S PICKLING PLANT.

Cooker Plate Practice

As the vitreous enameller buys his sheets already pickled, any further preliminary processing that is required is that necessary to remove the grease which he puts on, or oxides and rust which he allows to form, by any heat-treatment to which the metal is subjected. This second pickling, therefore, is a mere cleaning process for which hydrochloric acid and the simplest of plant suffices. Owing to the development of mass production, and the mere cost of handling, mechanical equipment, such as continuous spray plants, is appearing, which of itself draws attention to the chemistry and physics of the process of pickling. Take, for example, the enamelling of gas cookers. Figs. 1 and 2 show a plant erected for R. & A. Main, Limited, some years ago. Here the pickle consists of a 15 per cent. solution of HCl and is not heated. The temperature of the bath is around 18 deg. C. The plates are immersed by monel metal racks, and kept in the acid for 5 to 20 min. to remove the oxide after degreasing. The pickling time seems to depend largely on the quality of the sheet. An overhead traveller transfers the rack to a wash tank alongside to remove the film of acid adhering, and then to a soda tank for complete neutralisation.

It has been found that air agitation is necessary to ensure that spots of grease not removed by the degreasing process do not interfere with pickling. The tanks are constructed of reinforced concrete, rubber-lined by the Nordac process, and protected with a patent tiled lining. The pickling and wash tank form one block, and are identical in construction, for in due course the wash water becomes slightly acid. A feature of these tanks is the provision for decanting and removal of sludge which forms in the pickling tank. Referring to Fig. 1, a deep air lift well, A, is fitted in the bottom of each tank lined with rubber, which is continuous with the lining of the walls and bottom of the tank. The air lift pump, B, constructed of soft rubber, can be placed in the well to empty completely the tank. When decanting the wash water tank is first emptied and cleaned out; a decanting pipe, C, is fitted in the well in the pickling tank, provided with openings, which prevents the lower 3 in. of the liquor (that is the layer containing the settled sludge) from entering the well. The air lift pump is now lowered in the well, compressed air turned on, and the clear settled acid pickle pumped into the prepared wash water tank. The pickle tank now has left in it

a 3-in. layer of dirty acid and sludge. To remove this the decanting pipe is removed, which allows the sludge to flow into the well, which is then pumped by the same air lift pump into the drain. After hosing down the pickle tank the air lift pump is lowered into the wash water tank to pump back the settled acid into its original tank. The same result, of course, could be obtained by pumping the dirty acid through a filter, but this would require more plant, and would take longer. Settling is always much quicker than filtering, and is, of course, cheaper.

The floors, gullies and drains surrounding the tank are rubber-lined and tiled, and made absolutely acid-resisting, and so preventing acid seeping into the concrete foundations. Fumes are extracted by ducts and fans, which will be discussed later in the Paper.

The 3-in. layer of sludge is discharged about every two weeks, and with it sufficient iron chloride to keep the bath below saturation point. Thus by topping up with fresh acid, and removing this sludge, the bath is kept constantly in pickling condition. Apart from the sludge no acid is discharged into the drains.

Wire Pickling

The pickling of wire for galvanising, and for covering with flux for electrodes, is similar to that for enamelling. Here the wire in coil form is immersed in a bath of 20 per cent. HCl without heat. The scale is removed at first in 20 min., but as the concentration falls to 11 per cent. HCl, the time of pickling increases to 1 hr., when the bath is discharged to the neutralising plant. The coils are transferred to a water spray tank, then to a soda tank, and finally to a drying oven. When the plant is in full operation, the temperature of the bath rises gradually to 41 deg. C., when fuming becomes troublesome. An efficient fume extraction system is essential. As this plant offered excellent opportunity to study recovery, the Author began an investigation which led to process protected by British Patent No. 562,596.[3] If this spent acid containing 11 per cent. free HCl and iron as chloride equivalent to the remaining 9 per cent. HCl (to make up the original 20 per cent.) be treated with H_2SO_4 equivalent to the iron, the ferrous chloride is decomposed with the regeneration of the HCl, and the formation of ferrous sulphate. The bath is thus regenerated, and pickling proceeds till the free HCl is reduced to 11 per

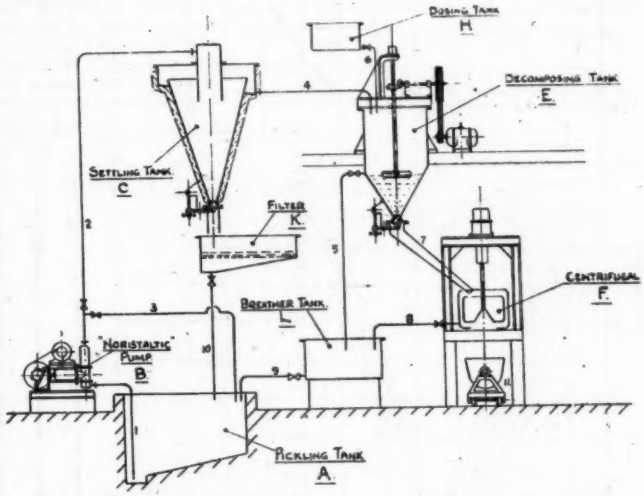

FIG. 3.—A PICKLING PLANT DESIGNED TO USE SULPHURIC ACID.

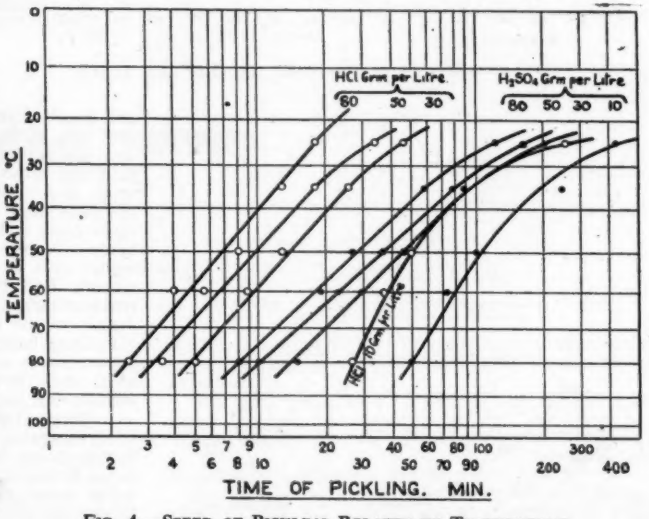

FIG. 4.—SPEED OF PICKLING RELATED TO TEMPERATURE (WINTERBOTTOM AND READ).

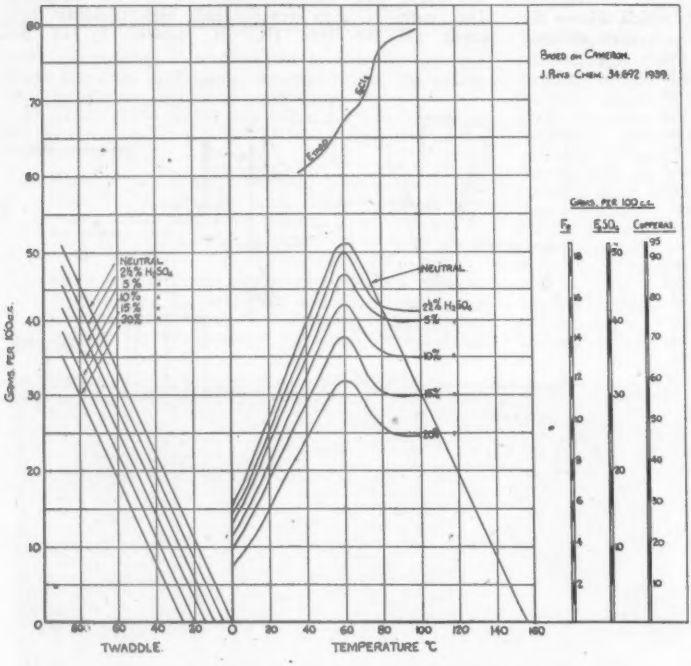

FIG. 5.—SOLUBILITY OF $FeSO_4$ IN H_2O AND H_2SO_4

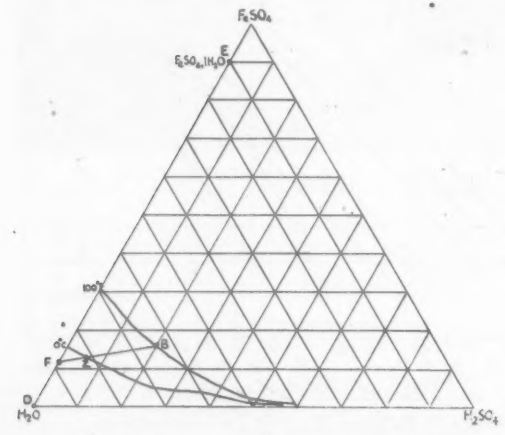

FIG. 6.—SOLUBILITY DIAGRAM OF $FeSO_4$.

Pickling and the Vitreous Enameller

cent. again. The dosing with the equivalent H_2SO_4 is repeated with the regeneration of the HCl, and the formation of more ferrous sulphate. This cycle of operations is repeated till the bath becomes saturated with ferrous sulphate. At this stage, pickling proceeds with the simultaneous deposition of ferrous sulphate containing one or two molecules of water. The highest activity of this reaction is at 51 deg. C. The process has the following advantage: pickling is done by H_2SO_4, a cheaper acid, the HCl being merely a carrier or agent. The monohydrous sulphate is easier to handle than copperas, and easier converted to H_2SO_4. Fig. 3 shows the plant required to carry out this process.

Chemistry and Physics of Pickling Baths

The usual pickling bath for the vitreous enameller consists of solutions of HCl varying from 5 to 20 per cent. The advantages of HCl are rapid pickling, as shown in Fig. 4 taken from Winterbottom and Read's Paper, and lengthy use of the bath due to the high solubility of ferrous chloride (see Fig. 5); and low viscosity of the bath compared with sulphuric acid and consequently less carry-over of acid into the wash tank. The greatest advantage, however, is that the bath does not need extraneous heat, as pickling takes place sufficiently rapid at low temperatures—say below 40 deg. C. The disadvantages are first the higher cost of the acid compared with other baths; second, HCl fumes badly needing expensive fume removal plant; third, arising out of the second is the danger to the health of the workers.

Pickling baths of sulphuric acid are cheaper, and as the acid does not readily fume, work is more comfortable, and there is less risk of corrosion of the surrounding plant. The disadvantages are slow pickling at ordinary temperatures, which necessitates heating to temperatures of 70 deg. C. and over, almost boiling point, lower solubility of the iron sulphate, hence frequent renewal of the bath and loss of acid.

The newer mixed acid bath consisting generally of 10 per cent. solution of H_2SO_4 with 1 to 5 per cent. HCl, combine the advantages and disadvantages of both. They have the great merit that they permit of

easy regeneration and recovery. The modern example of the mixed bath is the de Lattre process, as described in British Patent No. 517,998,[4] and already referred to in the Author's Paper.[1]

There is not much to be said concerning the use of pure HCl baths. It is usually the first choice of the enameller, and any adjustments of the bath are concerned with inhibitors for reducing attack on the cleaned surface, and thereby reducing the amount of hydrogen gas evolved. As this gas bubbles from the surface, it carries with it a quantity of acid spray, which is extremely irksome to the workers. Few enamellers have as yet considered the use of the mixed bath, but Curran Bros., Limited, of Cardiff, are investigating these processes as they are developed.

The chemistry of the pure sulphuric acid bath has been worked out by Cameron, and the information can be represented diagrammatically by Fig. 5 and the triangular diagram, Fig. 6. The difficulty in using it lies in the absence of accurate figures for the specific gravity of the solutions. The control of pickling baths is usually made on a W/V basis, that is weight of salt in a given volume of solution, but Fig. 5 shows how to convert W/V (weight/volume) to W/W (weight/weight). The equilibrium diagram vastly simplifies the calculations needed to determine what amount of ferrous salts is deposited by cooling or by evaporation. Thus referring to Fig. 6, and taking a case which is under consideration at the present time: The composition of a spent liquor which is discharged at present, *viz.*, 6 per cent. W/V H_2SO_4 and 15 per cent. W/V $FeSO_4$ is shown by point Z (after transforming to real percentages 5 per cent. W/W H_2SO_4 and 12.5 per cent. W/W $FeSO_4$). This shows that the solution would not deposit crystals until cooled below zero centigrade, for point Z lies on the equilibrium line at 0 deg. C. It would, however, be possible to recover the acid even from this dilute solution, by evaporating until the final solution contained, say, 20 per cent. W/W H_2SO_4, point B on the diagram (the intersection of the 20 per cent. H_2SO_4 line with the ferrous sulphate saturation line at boiling point). The quantity of water which will have to be removed, and the weight of ferrous sulphate monohydrate deposited, can be readily calculated as follows:—

Join BZ and produce to cut zero acid line at F, then weight of water + monohydrate to be removed is shown by ratio $\frac{BZ}{BF} = 75$ per cent. And this mixture will consist of:—

$\frac{FE}{DE} \times 75$ per cent. of steam $= 65.4$ per cent. of spent liquor weight,

and of $\frac{DF}{DE} \times 75$ per cent. of monohydrate $= 9.6$ per cent. of spent liquor weight.

(Point E is point representing monohydrate ($FeSO_4 + 1H_2O$).)

The triangular diagram is not suited to the pure HCl bath, as the solubility of the iron is so high that there is little chance of reaching saturation point during pickling, and, of course, regeneration is never attempted.

Now the mixed bath is quite different, and it is along this path that development lies. De Lattre has reduced the temperature of the bath from 70 deg. C. or 80 deg. C. to 50 to 60 deg. C.; increased the solubility, and rendered recovery easier.

The Author,[3] by using a saturated solution of ferrous sulphate, and by dosing, uses any such bath from 5 per cent. HCl to 20 per cent. HCl. The mixed bath can easily be prepared from salt (NaCl) and so

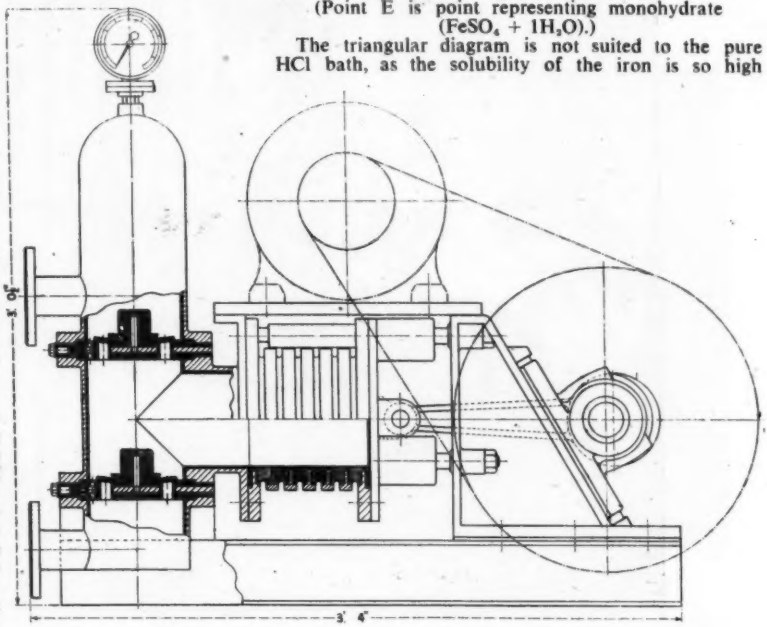

FIG. 7.—SECTIONAL VIEW OF THE "NORISTALTIC" GLANDLESS PUMP.

Pickling and the Vitreous Enameller

save the cost of expensive HCl rubber-lined storage plant and equipment. Strong H_2SO_4 can be stored easily in ordinary iron and steel vessels, provided the ordinarv air is excluded from the tank, during filling and emptying. A further advantage of mixed baths is that the presence of much ferrous sulphate acts as an inhibitor, and so saves the cost of ordinary inhibitors.

spent HCl acid was not to exceed 1 gall. per hr. It was distinctly difficult to construct a pump to do this, but in the end a small air lift was fixed with hidden orifices in the air pipe to prevent over-pumping.

The introduction some 20 years ago of rubber-lined plant, and the development of lining processes that could be carried out on the site, has enabled HCl solution to be handled with comparative ease. Pickling tanks are now constructed of reinforced concrete or brickwork lined with ¼ in. rubber and protected by tiles or acid-resisting bricks, set in special acid-resist-

FIG. 8.—GENERAL APPEARANCE OF THE "NORISTALTIC" PUMP.

The Plant

The usual plant in use in these cleaning processes is very crude; stone and wood tanks and sometimes rubber-lined tanks for pickling, the HCl tipped in from carboys, and the bath when spent discharged from a plugged-up hole or by syphon into the drain, and eventually with or without neutralisation to some stream or sewer. In some districts where the water is hard, the authorities do not object, provided the discharge is controlled and run in over a long period. In one instance, to personal knowledge, the flow of

ing cements. Pipes, valves and fittings of robust construction are rubber-lined or lined with flexible ebonites, of which Vulcoferran is an example. The pumping of HCl is difficult. Rubber-lined centrifugal pumps are fairly satisfactory, but need careful and frequent packing of the stuffing boxes.

The new "Noristaltic" glandless pump, Figs. 7 and 8, has been specially designed for handling pickling liquors. The main feature is a rubber compressible cylinder composed of rings of rubber separated by metal tee rings, which are vulcanised in the walls. On compression, the rubber rings are compressed

inwards, thus increasing the displacement caused by the stroke. The stroke is 1/10th that of the length of the cylinder. All internal parts are, of course, lined with rubber or Vulcoferran. The pump has a powerful suction, and is thus suitable for emptying sumps, and can handle dirty sludges and deposits, at temperatures of 70 to 80 deg. C. The rubber cylinder is designed for 80 to 100 lbs. per sq. ft. pressure.

Fume Extraction

The complete withdrawal of fumes from HCl tanks is difficult without the use of hoods. These, however, interfere with the pickle operation. After many trials and much experimenting, it has been found that for open tanks, blowing hot high pressure air across the tank and withdrawing it through a side hood with a low pressure air screw of ample capacity and using large diameter ducting is successful. The total pressure on any system should not exceed ½ in. water gauge, and, of course, all parts will have to be rubber or Vulcoferran covered. There are a few snags in the placing of the jets and openings, but a few preliminary tests usually solve this problem. The ordinary ventilating practice must not be followed. Every trace of HCl fume must be caught, and for this the usual figure needs a factor from 4 to 8.

Spray Pickling Machine

Curran Bros., Limited, of Cardiff, have developed a machine (Fig. 9) in which sheets and stampings are pickled continuously as they pass on a conveyor through a chamber fitted with spray pipes. For sheets one set of pipes delivers a spray downwards, and another a spray upwards, but for pickling stampings, the pipes are arranged so that jets of acid liquor impinge on the work from all directions. The jets continuously bring fresh liquor into contact with the surfaces, and wash away the old liquor and detach any hydrogen bubbles, the combined effect of which produces a great increase in the speed of pickling. It is clearly necessary to maintain the bath at a constant pickling strength. This points to the use of mixed acid baths, which, as already described, permit the removal of sulphate while pickling proceeds. All parts of the machine in contact with the acid are rubber-lined. The spray pipes are of Vulcoferran reinforced with steel strip to give the necessary stiffness at the working temperature of 70 deg. C. and the conveyors of rubber-covered steel cable, or of some flexible acid-resisting metal. Special details have been worked out to give easy access for repair and to prevent leakage and damage to the lining.

(*Continued at foot of next column.*)

FIG. 9.—SPRAY PICKLING MACHINE DEVELOPED BY CURRAN BROS.

(*Continued from previous column.*)

REFERENCES

1 "The Treatment of Spent Pickle." N. Swindin, I. Chem. Engrs
2 Winterbottom and Read, Iron and Steel Inst., 1932.
3 Brit. Pat. 562,596, N. Swindin.
4 de Lattre, Brit. Pat. 517,998, 1938.

NEW AND REVISED STANDARDS

The monthly information sheet of the British Standards Institution for February lists amongst the new Standards issued:—B.S. 1,189—1944: Cast-iron baths for domestic purposes (dimensions and workmanship) (2s.); 1,205, Part 1—1945: Cast-iron gutters, fittings and accessories—half round gutters (2s.), and 1,211—1945: Centrifugally cast- (spun) iron pipes for water, gas and sewage (2s.).

Amongst revised Standards are:—416—1944: Cast-iron spigot and socket soil, waste and ventilating pipes, fittings and accessories (3s. 6d.), and 417—1944: Galvanised mild-steel cisterns, tanks and cylinders (2s.).

These can be obtained by writing to 28, Victoria Street, London, S.W.1.

VISCOUNT MARGESSON has joined the board of International Combustion, Limited.

BOOM IN THE SCOTTISH FOUNDRY INDUSTRY

(FROM OUR SCOTTISH CORRESPONDENT)

The foundry and allied trades in Scotland will be busy for many years to come. Large orders have been placed with Scottish firms for kitchen and living-room grates, electric and gas cookers, and other equipment for temporary and permanent houses. Contracts are also being negotiated for baths, pipes and other household utilities in which the foundries specialise. The sanitary engineering companies also are assured of full employment for almost a decade and are getting ready for the busiest period in their history. Our representative understands that the value of the preliminary contracts for grates and electric and gas fires and cookers is in the region of £500,000, and that all concerned have been told the orders are so urgent that they are to be spread over the industry so that every capable firm can take part in the production. Falkirk, Bonnybridge, Carron and other foundry towns and villages will benefit to a large extent, and Glasgow, Lanarkshire, Renfrewshire and Ayrshire concerns will also share in the contracts.

One Ayrshire firm has stated that its employees will be increased from 600 to 1,100 as soon as production can be maintained. Smaller companies which started during the war to make special parts for the big combines will also be included. Some of the contracts are associated with Portal, Phœnix and other temporary houses, but the biggest orders will be connected with permanent housing, of which Scotland alone will need a minimum of more than 500,000, which may be completed and equipped within 15 years or thereabouts.

Confidence in the Future

During the past six years the heavy engineering industry in Scotland has made an immense contribution to victory; and now it is ready to switch over to all-out production in peace. Every steel manufacturer with whom our representative talked was full of confidence for the immediate future. Stewarts and Lloyds, Limited, who have set up their own records for production at their works every successive year since the war started, are now probably the biggest steel-tube extractors and manipulators in the world. At their Tollcross works, where they turned out a sideline of a million shells in two years, capacity has been increased by about 25 per cent. during the war, and the firm is confident that it will be fully required for a long time to come. Boiler tubes will be needed all over the world. Locomotives and ships will require to be re-tubed in thousands of cases. Oil pipelines should also make great demands as these are developed —it may be necessary to replace thousands of miles in the Middle East alone. The firm have extended and modernised until their plant is as up to date as any in the world.

In the international market the Americans start with a considerable advantage, as their steel is produced at something like half the cost of ours. The British difficulties are that coal is dear and that we have to import ore, and Mr. James M'Caig, of Stewarts and Lloyds, made the interesting suggestion that there should be established a big central steelworks at some convenient point on the Scottish West Coast—Ardrossan was his proposed site.

At present the shops of the North British Locomotive Company, Limited, Springburn, are building for Service purposes in the Far East. During recent years they have been building "austerity" locomotives—well over 500 of them—which have been shipped overseas at once. The company has also turned out several hundred Matilda tanks. One of the officials of the company said that they were anticipating a very pressing time for a number of years to come. The firm, the biggest locomotive builders in the country, is largely dependent on Empire and foreign railways for its orders. It is hoped to go back into the Continental market on a big scale, as the need for locomotives will obviously be of a high and lengthy priority.

Most of the Royal Ordnance factories are likely to suffer severe cuts as soon as possible, but one should continue to operate, as it is primarily a foundry concern. The most interesting feature here is that more than half of the 1,500 workers are women of middle age. About 70 per cent. of them are married, most of them mothers, and the average age is over 40.

At Clydebank the Singer Manufacturing Company, Limited, have produced a wartime range which is probably quite unrivalled by any other engineering concern. The directorate claim that it would have been quite impossible to fight at all if it had not been for their vast variety of sewing machines. These are used for such diverse purposes as the making of parachutes and sandbags, powder bags for shells and gas masks, industrial gloves, and uniforms. In addition, Singers have turned out something like 1,500 different war items, including tank track links, the new British bayonet, well over 1,000,000 industrial needle points weekly, 100,000 flash lamps for castaway sailors, tens of thousands of hand grenades and incendiary bombs, bomb-release gear, aircraft windscreen wipers, Sten guns, and 117,000,000 armour-piercing bullets for which 3,246 miles of steel were used. A post-war boom is also visualised here, and one director has stated that "our programme is the utmost possible maximum for years to come. The demands of the export market are obviously going to be enormous, but possible output is strictly limited by the supplies of raw materials."

Highly Mechanised Foundry

The North British Steel Foundry, Limited, Leith, appears to have a bright future. This is probably the most highly mechanised steelfoundry in Scotland, and a great variety of castings are being turned out very rapidly. Of the workers, only 11 had previous experience in a steelworks. The first steel castings were for tanks of various types, but more recently the variation in the work has increased, and now the range extends from various bomb castings to a new type of cast-steel anchor. The operations at this works have been filmed for the Chinese and the Russians to show how women can tackle such comparatively heavy work.

INDUCTION HEATING

By S. G. KING

This Paper, which was read before the annual meeting of the Institute of Vitreous Enamellers, held at Manchester, dealt at some length with the fundamental principles. The Author summarised the advantages and disadvantages of induction heating, as follow:—

(1) Very fast heating and therefore ability of the plant to maintain high predetermined rate of production.

(2) Localised heating. This, coupled with fast heating, will often enable the weight heated to be only a small part of the total weight, thus enabling economies to be effected in power consumption.

(3) Reduction of distortion, especially where the heat is applied locally and at great speed, so that part of the work remains cold and thus provides strength to prevent distortion.

(4) Accuracy of control and repetition. This is an advantage which can usually be claimed for any type of electrical operation. It is especially true in the case of induction heating as compared with other methods of heating where measurement of heat input or temperature may be exceedingly difficult.

(5) Absence of products of combustion. Thus there is no tendency of contamination of the heated charge by, say, sulphur, as is found with fuel-fired furnaces.

(6) Following on the last-named advantage, it may be noted that with induction heating it is easy to apply a protective atmosphere (or vacuum), and the cost of so doing is comparatively small, because of the highly localised heating. If the object to be heated is cylindrical, the inductor coil would be of the same shape, and the annular space between them may be fed with a very small supply of inert gas. If this gas is of an expensive type, such as lithium, the charge to the coil may be completely enclosed during the heating operation and a continuous feed can be arranged without undue difficulty.

The main disadvantage of induction heating is the high initial expenditure. In general, electric heating of any kind is expensive in the first place, and it must be faced that induction heating is even more expensive than the better known forms of electric heating. The reason for this is that often a high-frequency converter must be installed and, in order to make the apparatus suitable for industrial use, special precautions have to be taken in the design of the plant.

There are cases on record where induction heating has proved to be less expensive than other forms, including fuel-firing, but, in general, it will be necessary to look for the production of a better product to be sold at a higher price. An example of this is to be found in many of the expensive alloy steels, for example, tool steels, nearly all of which are melted in a high-frequency induction furnace. The melting cost is higher than by other means, but the product is better and therefore commands a higher price. In some cases induction heating will enable a process to be carried out which could not be done by any other means. In this case there will also be no difficulty in justifying the expenditure.

DISCUSSION

The CHAIRMAN (Mr. W. Todd) said it was evident that the attention of vitreous enamellers was being directed towards the drying problems of the future. Both Mr. Silman's Paper and Mr. King's Paper had shown there were new methods of heating to be considered in respect to the solution of scientific problems.

DR. DEUTSCH asked if there was any appreciable difference in the rate of heating if bodies like cast iron or enamel sheet were being heated. As far as he was aware, everything depended upon the dielectric properties, and an enamel coat would probably have different properties from the metal body. Would the enamel coat be more quickly heated than, say, cast iron of an appreciable thickness? Taking the matter the other way round, was it suggested that the metal would be heated first and then the coating?

MR. KING thought that what Dr. Deutsch had in mind was that when a current passed into the surface of the metal, as it would, there might be another current going through to the enamel. Was he right?

DR. DEUTSCH was not so much thinking of the current, but the heating effect of the coating and the metal. There would be an appreciable difference of temperature in the metal and in the enamel coat.

MR. KING replied that it would depend upon the thermal conductivity of the enamel. The only difference was that it would receive its heat from the surface of the metal, where, he supposed, Dr. Deutsch would want to have a very remarkable control of the temperature in order to get a point. If he was going to draw off any gases from that point, that was where the temperature would be wanted. It would not necessarily be confined to accurate control. The enamel itself would play no part at all in the electrical behaviour of the device in induction heating. Enamel was, normally, a very poor conductor of electricity even when hot. Some of the frits and porcelain and some of the glasses had a certain amount of conductivity when they were hot. Most of the heat would be developed in the metal itself, and near the surface, and would transfer itself by ordinary thermal conduction to the enamel finish.

A Special Problem

MR. SWINDIN asked if an arrangement could be devised for heating acid liquor inside a rubber-lined bottle. Could a cylinder of that sort be enamelled? Could the induction heating be inside the lid so as to get the heat inside the cylinder? If it could, there were many cases in which it would prove to be an advantage.

MR. KING said it was a very nice point and he would consult with Mr. Swindin afterwards. As he gathered it, the real problem was, because the article was rubber-lined, it did not conduct heat very well. The ideal way would be to put heat into the solution itself. Electrolytic methods were out of court, because of the troubles connected with electrodes and the introduction

Induction Heating

of gases; so it was necessary to have something inside the liquid to heat it by induction. This was possible by having an internal coil inside another container.

The distillation of neat sulphuric acid might be of interest. It was done by gas-heating pots. Neat sulphuric acid was not a good conductor. It did not appear to be possible to heat the liquid by electrolytic means, and the solution appeared to be to heat the cast-iron pot by wrapping a coil round it.

MR. HEELEY had not intended to say anything about induction heating, but Mr. King had evidently got a wrong impression. He had shown pictures which were typical of the heat of cores, but he (the speaker) and his colleague had not looked at very minute areas. What had been looked at was many inches of the metal. If there was any impression that the bowls were arranged in any particular manner, and therefore had some bearing upon heating by induction, he would like to correct it. They were most haphazard. He would not like anyone to go away from the conference with a wrong impression.

Mention had been made of join-ups. He had fairly consistently refused to be drawn upon this point at the conference, because it was necessary to make a distinction between speculation and facts. Much of the literature published in America was of a speculative character.

Perhaps he might venture to make one small speculation. Neither he nor his colleague believed that any of the large joints which caused the trouble were quite different from indiarubber. It was said that induction heating was used for enamelling; he assumed it was intended to apply it to local patches of enamelling. He would utter a word of warning—what about cooling afterwards?

An Experiment with Ceramics

MR. KING would like to shake hands with Mr. Heeley because he had said he was not a vitreous enameller; neither was he, but he could now understand some of the problems which confronted the enameller. For the past two years he had been dealing with a certain ceramic material. It was of various compositions, such as frit and mica, very carefully milled, mixed, and then milled again. Material was made of the mixture, fired in certain ways, taking extraordinary care over the milling and over the whole operation. Plates were made of a certain size. In one case 500 holes were drilled in such a plate. Upon looking at the structure which existed inside the whole, it was found there was uniformity. Then it was examined in a much simpler way. The plate of insulating material was taken out, a metal plate was put on the back and a plate underneath, just as Mr. Heeley did with his bolts. Bolts were put on top, and eventually it was found there was a fault somewhere in the plate.

Microscopical examination was made, and it was found that there was a mathematical probability of the occurrence of a fault due to the frit forming bubbles and the bubbles joining up one with the other. When the holes were drilled, the chance of finding them was small, but as soon as the electrical method was adopted they were discovered. It was also found that the larger the area of the plate, the greater the probability of the faults occurring. The only conclusion which could be arrived at, after taking all precautions with regard to mixing and milling, was that there was a maximum with regard to size of plate which it was worth while making, namely, 14 by 18. Going beyond that size, the chance of getting a good plate decreased very rapidly; so it was decided not to make anything larger.

Mr. J. H. GRAY had been concerned with heat-treatment in a tank factory. It was unfortunate that the induction type of plant for that kind of work was not introduced earlier in the war. Reverting to enamelling, he thought all the troubles which had been mentioned the previous evening were caused by gases escaping from the iron. The reason those gases were permitted to escape in so small a surface of the enamel was the heating up of the casting or the sheet plate.

It seemed as though the introduction of induction heating might quite easily be applied to the melting of enamel frit and spraying vessels with molten enamel which had been heated up by induction heating. There might be quite a field of thought in that direction, and much trouble which so far had been experienced might be overcome.

MR. J. W. GARDOM said the first American plant which came into this country was operated in Derbyshire.

MR. BIDDULPH said that; upon viewing the illustrations shown with regard to the application of induction heating, it would appear as though the plant was designed for a specific job of a specific shape.

MR. KING agreed.

Heating Complicated Shape

MR. BIDDULPH asked, was there any possibility of the application of induction heating to what was normally thought of as an enamelling furnace into which articles of varying shapes could be placed, say, cooker legs?

MR. KING said the appliance would have to be designed for a shape If it was desired to make cooker legs, then there must be a run on cooker legs and nothing else. The point was that the coil would cast 1 or 2 per cent. of the job. Another coil would do the cooker knobs, and another would do the hotplate. The appliance would have to be rather big for something which would do the legs at the same time, but still there could be several different coils. The coils had to be rather carefully designed, and it was unlikely that a coil would work efficiently with a number of different shapes and sizes.

A hearty vote of thanks was accorded to Mr. King for his Paper.

ENGINEER REAR-ADMIRAL EDOUARD GAUDIN, the well-known naval engineer, died recently, in his 80th year. He was largely responsible for the adoption of the Belleville and other water-tube boilers by the Royal Navy. He was a native of Guernsey.

MOULD SURFACE GAS PRESSURE

In a Paper which Mr. H. W. Dietert, Mr. R. L. Doelman and Mr. R. W. Bennett presented to the annual meeting of the American Foundrymen's Association, the Authors have drawn the following conclusions, prefaced by this statement:—

Foundrymen have appreciated in the past that in the mould surface there existed conditions which the Authors describe as hot permeability, gas volume, back gas pressure, and mould gas flow. A technical presentation on this subject matter presents a larger number of possible pitfalls since the amount of exact data and their correlation are rather limited in present-day literature. Knowing that foundrymen will excuse such conclusive remarks as may be found in error at a future day, the Authors will proceed to draw conclusions to the best of their ability.

(1) A.F.A. permeability value, since it is reported at a unit pressure of 1 grm., does not express a value that designates the possible gas flow or maximum venting of a sand surface under high mould gas pressure.

(2) Low A.F.A. permeability sands, such as pocket sand, are used in large castings, since ample metal pressure head is available to create sufficient pressure to cause a high back pressure that will step up the permeability to a high mould gas flow.

(3) Whenever the mould surface back pressure exceeds the mould molten metal pressure head, then the mould gas enters the mould metal.

(4) Whenever the mould surface back pressure is less than the mould molten metal pressure heat, then the mould gas enters the mould surface and allows the molten metal to partly or wholly enter the mould surface layer of sand.

(5) Mould gases are capable of carrying some elements of the moulding material or metal, which may be either in liquid or solid state. In other words, metal may pick up certain elements of the moulding material when conditions such as are in conclusion (3) exist. Conversely, the sand may pick up elements of the liquid or solidified metal where conditions described in conclusion (4) are present.

(6) The green, dry, baked, and hot permeability tests have only a fundamental control value in that the tests do not take into account the gas that will be generated at the mould surface or the back pressure that is created.

(7) A more direct manner of testing with easier practical application is a measurement of back pressure at mould molten metal temperatures.

(8) Permeability testing is still essential for control of the sand after indexing it with back-pressure requirements.

(9) Back-pressure measurements at elevated temperatures are made easily, requiring relatively simple testing equipment.

(10) Hot permeabilities at elevated temperatures are rather difficult to determine.

(11) Back pressure data may be applied very easily

(*Continued at foot of next column.*)

(*Continued from previous column.*)

by foundrymen by grouping moulds requiring a specified back pressure.

(12) Controlling back pressure of a sand mixture will require a control of the moisture, all additions of a sand, permeability, mould hardness, and other factors which may be uncovered as progress is made in this new control field.

(13) Incorporating a back-pressure control test probably will mark one of the greatest forward steps in mould control in that it leads to the way of eliminating blows, seams, and penetration defects.

BOOK REVIEWS

"Industrial Record, 1919-1939. A Review of the Inter-war Years by Cadbury Bros., Limited." Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 8s. 6d. net.

It is a far cry from chocolates to foundries, yet on studying this well-illustrated book, the reviewer was impressed with the notion that the same basic problems exist for those concerns which manufacture goods to be consumed by the general public. Lawn mowers, cookers, fires, electrical fittings, are just a few which very largely lend themselves to the same treatment as chocolate. Naturally, packing is of less importance, but the internal organisation can be paralleled. Anyway, it is of real interest to the progressive manufacturer to see how other industries tackle their problems.

One feature which has impressed itself on the reviewer is that the social insurances organised by Cadbury's are more comprehensive and cost more than the Beveridge proposals. This book contains many well designed coloured diagrams, which obviously are of real interest to any progressive manufacturer of articles on a large scale.

V. C. F.

"Damping Capacity: A General Survey of Existing Information." By Prof. F. C. Thompson, D.Met., M.Sc. Published by the British Non-Ferrous Metals Research Association, Euston Street, London, N.W.1. Price 3s. 6d.

At the request of the B.N.F.M.R.A., Main Research Committee, Prof. Thompson has here prepared a correlated survey of the present knowledge of the fundamentals of damping capacity, such as its metallurgical and mechanical significance and the validity of present methods of determining it. Suggestions are made of directions in which future experimental work might prove fruitful. The survey was prepared to guide the B.N.F.M.R.A., Main Research Committee in considering the desirability of initiating research on the subject. No attempt has been made in it to produce a compilation of numerical data. There is a bibliography of 58 references supplementing existing bibliographies to which reference is made.

INSTITUTE OF BRITISH FOUNDRYMEN

EAST ANGLIAN SECTION ANNUAL MEETING

A party of 31 members of the East Anglian Section of the London Branch of the Institute participated in a visit to the Waterside Works of Ransomes & Rapier, Limited, Ipswich, on March 22. The visitors assembled in the new works canteen, where they were welcomed by Mr. N. F. Dare (works manager), who introduced the party to the guides who were to conduct them round the various departments. The tour of the works included the iron and brass foundries, the patternshop, the erecting shop, the machine shops, the welding and smiths' shops, and a small experimental department where model sluice gates and other water control devices are tested out.

After the inspection the visitors were entertained at tea in the works canteen, during which Mr. C. H. Kain (President), in responding to Mr. Dare, expressed the thanks of the members to the management for having accorded them permission to inspect the works, and to the various guides for their patience in explaining the various points of interest throughout the tour.

Annual Report

Later in the day the annual general meeting was held in the Lecture Hall of the Central Library, Ipswich. The President, Mr. C. H. Kain, occupied the chair, and after the minutes of the previous annual meeting had been signed, the hon. secretary, Mr. A. N. Sumner, presented his report, in the course of which he said: The past year witnessed a noticeable easing in the travelling and blackout restrictions previously prevailing. This made for conditions more favourable to the organising of meetings, and allowed for, in the Section's programme of activities, the incorporation of two works visits, in addition to a total of six technical meetings. These visits were made, by the courtesy of the respective managements, to the Nacton Works of Crane, Limited, Ipswich, and to Lake & Elliot, Limited, Braintree. Although continuing with a summer session, the easier conditions further allowed for a change in meeting times, by reversion to pre-war evening meetings in place of continuing with Saturday afternoon meetings.

For one of the six meetings held, we were once again indebted to Mr. J. Gardom, this time in the capacity of National President, for his presentation of the Report on "Mechanical Handling in the Foundry"; "Views on Foundry Training," by Mr. R. F. Coates; "Centrifugal Casting in Sand Moulds," by Mr. C. H. Kain; the presentation by Mr. J. E. Newson of the Sub-Committee's Report on "Defects," and finally a "Foundry Inquest," made up the subject matter for the remaining meetings.

The membership strength of the Section has been much improved, as since the last annual meeting there have been no resignations. One member has been lost by transfer and one gained by transfer, while 14 new members have joined, making a net increase of 14 members and bringing the total for the Section to 73 members and one member firm. The average attendance during the session was 30 members per meeting, representing 4 per cent. of the present total membership.

Students of the Foundry Practice and Science Course at the Ipswich School of Technology took their City and Guilds of London Institute Foundry Practice and Science examinations in May. Five students were entered, and there were no failures. Three 1st class and two 2nd class passes were obtained. In addition, as a result of the high standard he attained, one of the students who gained a 1st class pass, Mr. J. M. Goymour, was awarded a Buchanan Silver Medal of the Institute, and equal first place for the City and Guilds Bronze Medal. The Technical Education Advisory Committee has met, and a new three-year course is well under way, a total of 21 students having enrolled at the beginning of the session.

Election of Officers

The following officers bearers for the ensuing session were elected:—President, Mr. D. Carrick; Vice-Presidents, Mr. A. F. Hammond and Mr. R. F. Coates; Hon. Secretary, Mr. A. N. Sumner; Councillors, Mr. V. Child and Mr. O. Pizzy.

The meeting unanimously decided that the Section should revert to the pre-war session, in place of continuing with the present meetings. As this would cause an unusually long non-meeting period if changed abruptly, it was decided to space the meetings for the coming session over a longer period, this making a half-summer, half-winter session. The following year would see a complete reversion to a full winter session. The evening concluded with a ¼-hr. show of silent films, including the new "Sifbronze" welding film. The films were obtained and shown by Mr. F. E. Tibbenham, of the Suffolk Iron Foundry (1920), Limited.

NEW CATALOGUE

Shot Blasting. The Pangborn Corporation, of Hagerstown, Maryland, U.S.A., have sent us a 24-page catalogue, carrying the very appropriate title of "Blast Cleaning Specials Made to Order." There is a wealth of illustrations, which show a wide variety of plants built for one set duty. Typical is a 500-lb. bomb cleaning, which tackles 40 per hr., another which, using 17 machines, cleans 90 to 100 aluminium cylinder heads per hr., whilst a third, handling a mixture of light and heavy tractor components, simultaneously blasts 10 to 12 tons per hr. An amazing piece of work is the hourly cleaning of 56 bath tubs and 168 36-in. sinks or 56 baths and 252 lavatories. The pictures are excellently produced, and the whole catalogue is particularly interesting.

THE HERCULES POWDER COMPANY, LIMITED, a subsidiary of the Hercules Powder Company, of Wilmington, Delaware, has opened an office at 140, Park Lane, London, W.1. Amongst their chief products is a well-known brand of core oil.

THE MODERN PIG

IF YOU WANT...
clean iron, free from sand, free from sows ...uniform analysis... convenient size...easy handling... specify
STANTON MACHINE CAST PIG IRON

SPECIFICATION

WEIGHT	80-90 lbs.
Length	22 inches
Width	8½ inches
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(at notch 2½ inches).

Made in our well-known

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NEWS IN BRIEF

THE SCHEME for the reorganisation of the capital structure of the Zinc Corporation, Limited, has been sanctioned.

THE HEAD OFFICE of the British Aluminium Company, Limited, is now at Salisbury House, London Wall, London, E.C.2.

THE ANNUAL GENERAL MEETING of the British Fluorspar Producers' Association will be held at the Crown Hotel, Matlock, on April 11, at 2.30 p.m.

JOHN DALE, LIMITED, announce that all inquiries in respect to their aluminium department should be addressed to their works at Ridgeview Road, London Colney, Herts.

ACCORDING TO TRADE STATISTICS issued in Dublin, total imports of iron and steel and manufactures in 1944 were £928.614, compared with £2,139,846 in 1939. Imports of non-ferrous ores, metals and manufactures in 1944 were £203,398, against £580,669 in 1939.

A LICENCE FOR the construction of oil engines of the Doxford type has been acquired by Vickers-Armstrongs, Limited. In addition to engines of their own design, they are therefore now able to undertake the manufacture of Doxford and M.A.N. double-acting engines.

ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED, announce in connection with the offer to exchange 10 £1 8 per cent. A.E.I. cumulative preference shares for every 11 £1 7 per cent. B.T.H. cumulative preference shares, that it has decided to extend the closing date to April 18.

THE DIRECTORS OF Broom & Wade, Limited, manufacturers of air compressors, pneumatic tools, etc., of High Wycombe, have secured provisional consent to an issue of 132,000 5s. ordinary shares at 18s. 9d. each, in the proportion of 22 for every 100 held on March 31. The issued will produce £123,750 gross.

THE MINISTER OF SUPPLY has given East Pool & Agar, Limited, three months' notice to terminate the contract for the purchase of the company's output of black tin. This action will entail the closing down of the mine; but the directors are considering whether other assistance can be obtained, or fresh capital raised.

THE NORTH-EAST ENGINEERING BUREAU, of Newcastle-upon-Tyne, which has a membership of 100 firms, announces the appointment of Mr. J. F. Gibbons as general manager, Mr. D. G. Brown, managing director of the Redheugh Iron & Steel Company, Limited, as chairman, and Mr. J. E. Spoors (accountant) as secretary.

SIR WILLIAM FIRTH, whose motion for an injunction to restrain Richard Thomas & Company, Limited, from acting on resolutions for the amalgamation of the company with Baldwins, Limited, was heard in the Chancery Division in February, when Mr. Justice Romer made no order, has announced that he has decided to discontinue the action.

THE IMPORTANCE of suitable scrap in the production of iron and steel is evident when statistics of the industry are studied. More than 55 million gross tons were charged into iron- and steel-making furnaces and foundry cupolas in the United States in 1943. About 75 per cent. of the scrap was used in steel products, 15 per cent. in making castings, 6 per cent. in the production of pig-iron, and the remainder for miscellaneous purposes.

AN AGREEMENT has been reached between Henry Simon, Limited, engineers, of Cheadle Heath, Stockport, and E. R. & F. Turner, Limited, milling machinery makers, ironfounders, etc., of Ipswich, which provides for the formation of a new company to foster export trade in British milling machinery. The new company will be known as Henry Simon & Turner, Limited. Henry Simon, Limited, and E. R. & F. Turner, Limited, will continue to trade separately in the home market and the new arrangement does not provide for any interchange of financial interest or board representation.

OBITUARY

LIEUT.-COL. FRANK W. HEYS, director of the Ferguslie Fireclay Works, Paisley, has died, aged 67.

MR. BASIL GEORGE BURGESS, for many years manager of the nitralloy department of Thos. Firth & John Brown, Limited, Sheffield, died suddenly on March 24, aged 64.

MR. ARCHIBALD MCGLASHAN, a director and former general manager of William Gray & Company, Limited, shipbuilders, of West Hartlepool, has died, aged 90. He retired 19 years ago. He was formerly chairman of the Tees and Hartlepools Shipbuilders' Federation.

MR. F. S. THOMPSON, chairman and joint managing director of Thompson Bros. (Bilston), Limited, Bradley Engineering Works, Bilston, died on March 22, aged 74. He had been connected with the firm for over 60 years. He was Deputy-Mayor of Wolverhampton and had been a member of the Town Council for 21 years.

BORAX AND BORIC ACID PRICES REVISED

With effect from April 2, producers' prices of borax and boric acid have been reduced. The revised prices for commercial quality (99½ per cent.) borax and boric acid are as follow:—Granulated, £30, £52; crystal, £31, £53; powder, £31 10s., £54; powder (extra fine), £32 10s., £56, all net, per ton, carriage paid customers' addresses in Great Britain, in bags, minimum 1-ton lots.

B.P. grades are £8 above the price of the corresponding grade of the commercial quality.

Quantity surcharges:—Less than 1-ton and minimum 5-cwt. lots, £1 per ton; less than 5-cwt. and minimum 3-cwt. lots, £2; less than 3-cwt. and minimum 1-cwt. lots, £3; less than 1 cwt., £5.

MACNAB MOULDING MACHINES

for High Production

In the up-to-date foundry of a well-known ordnance factory large quantities of non-ferrous castings are produced for anti-aircraft guns.

LATEST ENCLOSED SAND PROTECTED JOLT SQUEEZE MOULDING MACHINE

SPECIAL FEATURES:

- MASSIVE YET SYMMETRICAL CONSTRUCTION.
- JOLT RAM—A REAL BLOW.
- SQUEEZES TO A SET PRESSURE.
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- AIR ON OIL CONTROL TO DRAW.
- MECHANISM SAND PROTECTED.
- PATENT AIR-LOADED DISC VALVES.

MORE THAN 350 MACHINES OF THIS TYPE HAVE BEEN SUPPLIED.

ACCURACY is particularly important and Macnab Moulding Machines are used for all operations.

MACNAB Moulding Machines mean CLEAN, ACCURATE AND WELL FINISHED moulds—There are many sizes and types, suitable for economical production of varying classes of work. Full details will be sent on request. . . . . .

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COMPANY RESULTS

(Figures for previous year in brackets.)

Sanbra—Profit for 1944, £134,594 (£184,989); dividend of 12½% (same).

William Blythe—Final dividend of 10% (same) and a bonus of 5% (nil), making 20% (15%).

South Durham Steel & Iron—Final dividend of 2½%, making 8½% (same) on the ordinary shares and 2½% (same) on the "B" shares.

Hadfields—Net profit for 1944, after taxation, £200,443 (£192,679); final dividend of 15%, making 22½% (same); forward, £870,261 (£797,867).

Central Provinces Manganese Ore—Trading profit for 1944, £184,749 (£713,209); final dividend of 15%, tax free, making 22½% (same); forward, £108,720 (£128,303).

Ideal Boilers & Radiators—Profit for 1944, before taxation, £218,866 (£380,671); provision for taxation, £81,527 (£237,428); net profit, £131,810 (£136,283); final dividend of 2½%, tax free, making 10% (2½%); forward, £226,412 (£214,602).

Metropolitan Cammell Carriage & Wagon—Net profit for 1944, after taxation and deferred repairs, £113,326 (£112,122); to directors' fees, £2,000 (same); depreciation, £35,767 (£33,394); dividend of 7½%, tax free, £75,023; forward, £60,254 (£59,718).

Midland Electric Manufacturing—Trading profit for 1944, after taxation and war damage insurance, £46,462 (£44,385); to directors' fees, £200 (same); to general reserve, £20,000 (same); dividend of 10% (same) and bonus of 15% (same); forward, £35,820 (£28,960).

Engineering Components—Net dividend from subsidiaries, £18,938 (£19,075); interest, etc., £515 (£228); E.P.T. surplus, £4,065 (£7,468); to fees, £1,174 (£1,008); expenses, £774 (£887); income-tax, £1,098 (£2,776); net profit, £20,472 (£22,100); final dividend of 15% (same), making 25% (same); forward, £19,098 (£16,501).

English Steel Corporation—Profit for 1944, after taxation, repairs and post-war and other contingencies, £719,756 (£726,190); to interest on debenture, £59,838 (£61,026); debenture sinking fund, £20,984 (£19,796); directors' fees, £1,500 (same); depreciation, £350,000 (same); net profit, £287,434 (£293,868); forward, £187,123 (£175,646).

UNITED STEEL COMPANIES' OFFER

The directors of United Steel Companies, Limited, have made an offer to acquire the shares of the Yorkshire Engine Company, Limited, of Sheffield, on the basis of £22 for each £25 ordinary share, £22 paid, and to pay off the £5 fully-paid preference shares, together with seven years' dividend arrears. The circular states that United Steel Companies, Limited, have been very large customers of the Yorkshire Engine Company, Limited, and it has been deemed advisable to acquire the concern rather than establish engineering works of their own.

PERSONAL

MR. A. C. YEATES has been appointed a director of Crossley-Premier Engines, Limited.

MR. H. W. L. REDDISH has been elected a member of the board of the Trussed Concrete Steel Company, Limited.

SIR PATRICK HENNESSY, general manager of the Ford Motor Company, Limited, has been elected to the board.

MR. H. K. NEWCOMBE has resigned from the board of Barton & Sons, Limited, Atlas Works, Netherton, Dudley, Worcs.

AIR CHIEF MARSHAL SIR WILFRID RHODES FREEMAN has been appointed a director of Babcock & Wilcox, Limited.

MR. HARRY DOUGHTY, who has been associated with the Moston Malleable Castings Company, Limited, for 40 years, has been appointed managing director.

LT.-COL. GEORGE PATON POLLITT, D.S.O., a director of Imperial Chemical Industries, Limited, has been appointed a Sheriff for the county of Shropshire.

MR. ALBERT HENRY JARRARD has been appointed a director of the British Piston Ring Company, Limited, and of two of its subsidiaries—Bricovmo, Limited, and British Aero Components, Limited.

MR. G. E. TAYLOR has been appointed a managing director jointly with the present managing directors, Mr. D. F. Campbell and Mr. W. S. Gifford, of the Electric Furnace Company, Limited.

MR. W. COWEN has tendered his resignation from his executive position and from the board of Rolls-Royce, Limited, and Bentley Motors (1931), Limited, owing to reasons of health. MR. A. G. ELLIOTT, the company's chief engineer, has been appointed a director.

MR. E. PLAYER, technical director of Birmid Industries, Limited, has been appointed joint managing director of the company and also of the Birmingham Aluminium Casting (1903) Company, Limited, a subsidiary. Mr. Player will act with Mr. Cyril C. Maudslay, who continues as chairman and joint managing director of both companies.

MR. ERNEST BYFIELD HALL, who has been appointed a Sheriff for the county of Staffordshire, is chairman of the British Reinforced Concrete Engineering Company, Limited, the Chatwood Safe Company, Limited, chairman and governing director of Hall & Pickles, Limited, steel stockholders, of Manchester, and a director of the Australian Reinforced Concrete Engineering Company, Limited.

MR. G. E. TAYLOR has been appointed a managing director jointly with the present managing directors, Mr. D. F. Campbell and Mr. W. S. Gifford, of the Electric Furnace Company, Limited. MR. J. A. MONKS and MR. J. C. HOWARD have joined the board. Mr. Monks is already a director of the subsidiary company, the Electric Resistance Furnace Company, Limited, and Mr. Howard was the local director of the Electric Furnace Company's Sheffield office.

THE PREMATURE END OF MANY REFRACTORIES

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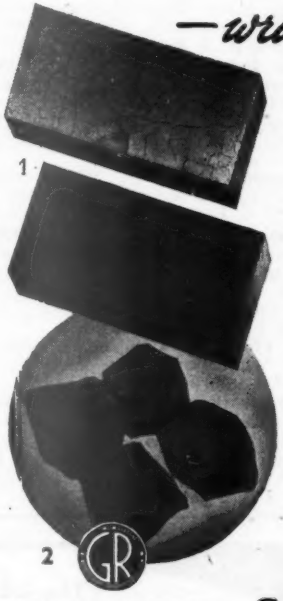

JOINTS are the weakest part of a furnace lining. Ordinary fireclay as a jointing material has certain fundamental disadvantages—it shrinks on drying and again on firing—the bricks do not remain bonded—and fireclay joints are readily attacked by slag. Durax No. 3 Refractory Cement for use with all types of fireclay bricks is a jointing material specially developed to overcome these serious disadvantages. It ensures the thinnest possible joints—sets hard without heat—and does not shrink during drying or firing.

Joints made with Durax No. 3 are as strong and as slag resistant as the fireclay bricks themselves. Its use ensures sound and homogeneous structures from which users can expect long life with a minimum of repairs. Full details on request.

DURAX No. 3 REFRACTORY CEMENT

NO SHRINKAGE. *Illustration (1) shows one firebrick coated with fireclay and the other with Durax No. 3. Both were allowed to dry at atmospheric temperature. The results are easily comparable in the photographic reproductions.*

STRENGTH. *Illustration (2) shows two test pieces allowed to dry at atmospheric temperature, and one fired to 1500° C. Tensile strength results — Unfired: 115 lbs. per sq. in. Fired: 912 lbs. per sq. in.*

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Raw Material Markets

IRON AND STEEL

Chiefly to conserve fuel, output of pig-iron has been reduced to the lowest possible point consistent with the needs of industry. Stocks, too, have been cut down to very small proportions and many foundries are working on narrow margins. There appears to be no scope for increased pig-iron allocations in the second period, although both the light and the heavy foundries have rather more work in hand. The best that the controlling authorities can do is to ensure the satisfaction of current needs, and at times foundries have to accept grades of iron different from those to which they have been accustomed. A brisk demand has developed for ferro-manganese and all the better grades of ferro-alloys.

Demands on the makers of bar iron are not excessive and can be met fairly readily.

The position in regard to steel semis is almost wholly unprecedented. Prior to the outbreak of war, and, indeed, until long after hostilities commenced, supplies of home-produced billets, blooms, sheet bars, etc., were supplemented by substantial tonnages of imported material. Now this traffic has almost wholly ceased, and although it is understood that the Control still holds certain stocks of imported material in reserve, the re-rolling mills are now exclusively using British material. Under these conditions quality is a secondary consideration, and the market for defectives is almost as brisk as it is for primes.

Expansion of the demand for heavy steel plates, joists and sections is so slight as to be almost imperceptible, but mills engaged on light material, such as small sections, rounds, squares and flats, steel bars and black sheets, will start the second period with healthy order-books. Indeed, indicated delivery dates for black and galvanised sheets now extend well into the third period.

THE WALES AND MONMOUTH BRANCH of the Institute of British Foundrymen have cancelled their original arrangements for a works visit and meeting on April 7. Instead, the annual meeting of the Branch will be held on April 14 at the Engineers' Institute, Cardiff, at 2.45 p.m., and will be followed by the reading of a Paper on "Phosphor-bronze Worm Wheel Blanks," by Mr. A. Hopwood.

NON-FERROUS METALS

The non-ferrous metal trades are marking time. For them, the "transition" period has already commenced, and it is bringing with it not difficulties so much as a feeling of frustration. The progress of the war in Germany suggests that there can be no large-scale increase in war requirements of the non-ferrous metals, and that in the future manufacturers must look to orders for peacetime products to keep their factories engaged. But so far no great advance has been made along the road to a change-over to peace production.

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

James Bailey (Blackburn), 37, Darwen Street, Blackburn—Brass founders, ironmongers, etc. £1,000. W. Yond and R. Whalley.

M.D.M., 135, Quinton Lane, Quinton, Birmingham, 32—Foundrymen, etc. £6,000. A. C. Duckworth, A. E., and W. Mosley.

Pheysey, Bridge Street, Stourport-on-Severn, Worcs—Ironfounders, engineers, etc. £4,000. T. Murray-Watson and R. B. Ripin.

Bentric Industries, 60, Meadway, London, N.14—Mechanical, electrical and general engineers. £1,000. R. S. and E. F. Antrobus.

Wembley Tool Company, Bridge Works, Bridge Road, Willesden, London, N.W.10—£10,000. M. T. Wilkinson and S. Cuming.

Britachrome Company, 10, Ryland Street, Birmingham—Electro-depositors of metals, etc. £3,000. C. and S. A. E. Wharrad.

William Shakespeare & Son (Sheffield), Eductor Works, John Street, Sheffield—Patternmakers. £250. W. L. and W. M. Shakespeare.

Wessex Guild, 21, Audley House, 11, Margaret Street, London, W.1—Engineers, etc. £2,000. R. D. Bibby, S. E. Parfitt, and J. Gold.

J. W. Flower & Company (Engineers), 43, New Borough, Wimborne, Dorset—£25,000. W. N. Flower, J. W. King, and J. F. Hatchard.

Hotchkiss (Eastbourne), Eastbourne Engineering Works, Ashford Road, Eastbourne—£4,000. W. F., G. C., R. E., and B. R. Hotchkiss.

Nesbitt, Owen & Company, 36, Long Lane, Finchley, London, N.3—Dealers in metals, machinery, etc. £1,000. S. J. Jack and J. E. Talbot.

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